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Food Safety: Introduction to Personal Hygiene

This module on personal hygiene is part of the Food Safety Knowledge Network's Basic Level resources for food manufacturers. This module was authored by Kevin Swoffer.

Welcome

Welcome to **Introduction to Personal Hygiene**.

This learning module is part of the Food Safety Knowledge Network Basic Level Program.

The Basic Level and Intermediate Level Programs were developed through a partnership between the Global Food Safety Initiative and Michigan State University to enhance the technical knowledge of individuals responsible for food safety, especially those working for small or less-developed businesses.

To learn more about the Food Safety Knowledge Network, please visit www.foodsafetyknowledge.network.org.

Module Overview

A high standard of personal hygiene is essential, especially where open food is prepared or processed. Many potential physical contaminants such as hair or microbiological contaminants such as bacteria arise from direct contact with the person handling food during the preparation, storage, or distribution phase.

This Basic Level learning module covers the requirements for effective control and management of personal hygiene.

The following topics will be discussed:

- system development
- hand-washing
- personal cleanliness

- illness
- personal behavior
- visitor procedures.

Module Objectives

Upon completion of this module you should be able to

- instruct an individual on the principles of and reasons for good personal hygiene
- provide specific knowledge about good personal hygiene practices
- know the importance of developing and managing systems for good personal hygiene
- identify a system for reporting illness.

System Development

As the person responsible for food safety within the factory it is important to develop a system to ensure and monitor that the staff is fully aware of and uses

- good personal cleanliness practices
- good personal behavior practices
- reporting processes for possible illnesses.

Any system will have to be clearly and concisely documented and communicated in detail to appropriate staff within the company. You must work closely with key company staff to ensure that they clearly understand the importance of such systems and how they can influence and achieve compliance.

Since the responsibility for food safety rests with you, direct verification of systems is extremely important for Basic Level requirements. You should personally and frequently monitor activities on a regular basis and record your findings.

Hand-Washing

It is widely recognized that hands are a potential source of microbiological and chemical contamination. Food handlers, if poorly trained and managed, pose possibly the greatest risk of microbiological contamination; in short, they may unwittingly poison foods and thus consumers.

Frequent hand-washing and good personal hygiene practices will significantly minimize the risk of product contamination. You must establish and maintain a system that ensures food-handlers wash their hands

- upon entering a food handling or processing area
- immediately after using the toilet
- after handling raw food or any contaminated material which could result in contamination of other food items
- after using a handkerchief
- after eating, drinking, or smoking
- after handling equipment cleaning machines or equipment cleaning utensils.

Hand-Washing Equipment

The company must provide an adequate number of washbasins at suitable locations designated for hand-washing.

Washbasins need to have a supply of hot and cold running water (or suitably temperature controlled) of appropriate microbiological and chemical quality.

A sufficient quantity of appropriate materials for cleaning hands needs to be available at all times. These materials should be appropriate and suitable for use in a food preparation area: unscented soaps or proprietary cleansers, for example.

You need to provide for the hygienic drying of hands. Any materials used for hand- drying must be disposed of without risk of contamination to food

products.

The facilities for washing and preparation of food need to be separate from the hand-washing facilities and must not be used for hand-washing.

Methodology

Each food handler should use the following method to ensure hands are appropriately clean.

1. Wet hands with warm running water and apply liquid soap or use a clean soap bar.
2. Rub hands vigorously for at least 20 seconds, giving special attention to the backs of the hands, wrists, between the fingers, and under the fingernails.
3. Rinse hands well while leaving the water running.
4. Dry hands with a clean single-use disposable towel or air drier.
5. Where a disposable towel is used, dispose of it without risk of contamination to the food products.
6. When turning off the water (if it is not automatically done), use dry hands or a clean disposable towel.

Hand-Washing Verification

Since hand-washing is critically important for the microbiological safety of food, the person responsible for food safety within the factory should monitor this activity carefully.

You must watch your employees' hand-washing activities on a fairly regular but non-predetermined basis to assess their compliance with the defined requirements. You may also have to do occasional visual checks on the cleanliness of hands.

Checks should be carried out and focused on risk periods (after toilet visits) and shift changes.

Personal Cleanliness

Every food handler must practice good personal cleanliness in order to minimize the risk of product contamination, be it physical, chemical, or microbiological.

In addition to hand-washing practices, there are a number of other matters that are important to ensure consumer safety.

- You should wear protective clothing.
- You should be aware of any ways in which injuries might occur.
- You should not wear jewelry, and you should be aware of where you have placed personal belongings.

Protective Clothing

Every food handler should wear protective clothing designed to protect the product from contamination.

Even then, protective clothing, if not carefully assessed beforehand, can itself be a source of product contamination. Buttons, fibers, or dirt may fall into or contaminate the product. Therefore, food handlers must wear clean, undamaged protective clothing. Domestic clothing must not be worn.

Hair also poses a major contamination risk. To prevent this risk, hair must be fully covered by suitable head coverings (hairnets/ hats), or in the case of facial hair, beard nets or snoods. Foot wear must be clean, free from debris, and designed in a way that does not pose any risk to the product.

Protective clothing should be stored under clean hygienic conditions and be regularly cleaned and thoroughly laundered. The company also needs to ensure that a sufficient quantity of protective clothing is available at all times.

Injury Exposure

If a food handler is injured, that injury could lead to the food being poisoned. You must make sure that all injuries to food handlers are covered.

If there is any risk of contamination, even with company-issued dressing or barrier protection such as a glove, the individual must be relieved of duties and not allowed to resume activities until considered deemed fit to do so by the manager responsible for food safety.

For injuries that are covered, the dressing must be issued by the company; and a record must be made of the issuing of this dressing. Supervisors need to be aware of the issuing of the dressing and be vigilant in ensuring that it is in place and that it poses no risk of product contamination.

Jewelry and Personal Belongings

Jewelry, if worn, can harbor dirt and bacteria and can itself contaminate food as a foreign body. It is understood that certain jewelry may be worn but it must not pose a risk of contamination to the product.

Rings and earrings may be allowed but these must be of a design to ensure easy cleaning and they or any components cannot fall off. Good examples of acceptable jewelry are solid band rings and one piece sleeper earrings.

Watches should not be worn in the production area.

Other personal effects, such as money and mobile telephones, must be stored away from any production area and never allowed in the immediate vicinity of food production.

Importance of Hand-Washing

This module has stressed, for obvious reasons, the need for rigorous hand-washing regimes.

Continually reminding your staff and verifying that they are abiding by hand-washing rules will serve to remind them of the absolute necessity for personal cleanliness at all times.

The hand-washing regime, which should instill personal discipline, must be encouraged by those responsible for food safety.

Jewelry and Personal Belongings

Jewelry, which often harbors dirt and bacteria, can contaminate food.

It is understood that certain jewelry (such as a wedding ring) may be worn, but it must not pose a risk of contamination to the product.

Rings and earrings may be allowed, but these must be of a design to ensure easy cleaning and not have any components that can fall off. Good examples of acceptable jewelry are solid band rings and one-piece sleeper earrings.

Watches cannot not be worn in the production area.

Other personal effects, such as money and mobile telephones, must be stored away from any production area and never allowed in the immediate vicinity of food production.

Illness

Food handlers who have an illness pose a direct hazard to the product by increasing the risk of contamination of the foods being prepared or produced.

The person responsible for food safety must be aware of the increased risk and be able to identify the symptoms of illnesses. A procedure needs to be in place to minimize the risk of contamination and safeguard the health of the customer.

Any person working with the company who exhibits any of the following symptoms must be excluded from the factory or production area until the illness has subsided and that employee has been given clearance to return to work by the person responsible for food safety:

- jaundice
- diarrhea
- vomiting
- fever
- sore throat with fever
- visible, infected skin lesions (boils, cuts, etc.)
- discharges from the ear, eye, or nose
- excessive coughing and sneezing.

Identifying Illnesses

As the person responsible for food safety, you must be fully aware of the symptoms of possible illnesses and also train supervisory staff to identify signs of illness in the employees they supervise. They should be trained to look for the visual signs of illness such as excessive sweating and high temperature. They should also be aware of other signs such as frequent visits to the toilet.

Supervisory staff needs to ensure steps are taken to exclude any employee who is identified as unwell.

You, as a supervisor, must also be aware of outbreaks of illnesses and look collectively at staff in the company to identify if certain individuals could have infected or are infecting others who work in the factory. In such cases, supervisory staff must be increasingly vigilant to identify those exhibiting symptoms of illness.

Reporting an Illness

In many countries it is a legal obligation for an individual to inform his or her employer if he or she feels unwell or is suffering from an illness.

You should instill a culture of openness about reporting illnesses. When employees begin working for the company, they should be trained to report illnesses and not work in the factory if they believe they are unwell.

Staff should also be encouraged to report if members of their family are unwell and may thus have infected the worker who could then infect the food, even if he or she does not seem infected. In such cases, a supervisor should make a decision on the most appropriate course of action.

Control of an Illness

If you have been informed of staff who are unwell or if you suspect that staff are unwell, you need to ensure that they are excluded from the factory until their symptoms subside and they no longer pose a risk of contamination to the product.

You should consult with a doctor or health practitioner to ensure appropriate tests and examinations are performed to determine that the ill employees do not return to work until it is safe.

When new employees are being considered, they should be questioned about their medical history and diseases or illnesses they have had or do currently have that could compromise the safety of the product. In the event that the product manufactured is high risk, then medical screening of applicants before employment may be necessary as a routine matter.

Personal Behavior

A person's behavior and personal habits can have a significant effect on the safety of a food product. Staff should be trained and supervised to ensure certain behaviors are discouraged.

Wherever possible, you should promote a culture of personal professionalism and pride in working in a food production environment. Employees should reflect the behavior expected of them. They should be carefully supervised to ensure appropriate behavior.

Improper Activities

To prevent contamination of the product, people working within a production area must refrain from the following activities:

- smoking
- spitting
- chewing or eating
- sneezing or coughing over unprotected food, food packaging, or utensils that are used for
- food contact or cleaning
- licking fingers
- biting of fingernails.

Preferably drinking of any liquid should not be allowed in the production area. However, when drinking is allowed in the production area, it should be controlled and supervised to

make sure safety of the product is not compromised. Any drink vessel should be disposed of in an appropriate manner.

Visitor Procedures

Visitors to a factory are subject to the same personal hygiene requirements as permanent employees.

Visitors, such as contractors coming to work on equipment or perform supply services such as pest control, may not be used to working within a food production environment, which means that there will be an increased risk of possible product contamination since there may not be proper hand-

washing, wearing of appropriate protective clothing, or the proper “stashing away” of personal effects.

Personal Hygiene for Visitors

All visitors and contractors visiting the factory production area are subject to the same personal hygiene requirements as food handlers.

They must be provided with company-issued protective clothing and instructed to follow the equivalent standards of personal behavior as the food handlers. They are also to exhibit the equivalent standards of personal cleanliness as the food handlers.

Visitors to the factory can be permitted into the factory production area with appropriate protective clothing and instruction on hygiene standards; however, they must not be allowed direct contact with food products or pose any risk of product contamination.

Visitors to the factory such as transport drivers are usually excluded from entering the production area.

Visitor Registration

Regardless of the good practices employed by a company, its reputation may be compromised by malpractice and the ignorance of visitors.

You must be fully aware of all visitors to the factory, their purpose for visiting the factory, and their movements within the factory. The method of recording such information is a visitor's register that will not only provide this information but will also instruct the visitor what your company requirements are and how they are to be met. They must confirm that they have fully understood the instructions and will comply with their obligations.

Visitors should always be greeted by an appropriate staff member who understands the importance of completing the register and can instruct the visitors on their obligations to meet the company's hygiene practices.

Food Safety: Introduction to Water Quality

This learning module is part of the Food Safety Knowledge Network Basic Level Program. The Basic Level and Intermediate Level Programs were developed through a partnership between the Global Food Safety Initiative and Michigan State University to enhance the technical knowledge of individuals responsible for food safety, especially those working for small or less-developed businesses. To learn more about the Food Safety Knowledge Network, please visit www.foodsafetyknowledgenetwork.org.

Welcome

Welcome to **Introduction to Water Quality**.

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Module Overview

A person responsible for food safety must know the necessary requirements for constructing water systems within the factory. Identifying possible points of contamination or reduction in the quality of the water is essential to maintain the safety of a product.

Having poor water quality or using contaminated water in food processing can affect the safety of products and potentially cause illness to many people. A good water quality management system will reduce this risk.

The following topics will be discussed:

- system development
- importance of water quality
- legal requirements and regulations
- Codex requirements
- proper construction of wells and plumbing systems
- monitoring and management

Module Objectives

Upon completion of this module, you should be able to

- describe reasons for ensuring water quality
- explain the regulations and customer requirements associated with water quality, ice, and steam
- explain the characteristics of properly-constructed water wells (where applicable) and plumbing systems necessary for delivery of potable water, ice, and steam
- design a system to ensure the quality of water, ice, and steam
- operate a system to ensure the quality of water, ice, and steam.

System Development

As the person responsible for food safety within the factory, you must develop systems that

- ensure that the staff is aware that they must use safe water during the food production process
- monitor the staff's use of safe water during the food production process
- ensure that the staff is aware of their responsibility to identify maintenance issues for water systems
- monitor the staff in identifying maintenance issues for water systems
- ensure that the staff is aware of hazard prevention practices
- monitor and review the risk analysis used in identifying all possible hazards concerned with water used within the factory.

Any system will have to be clearly and concisely documented and communicated effectively to appropriate staff within the company.

You must work closely with key company staff to ensure they clearly understand the importance of such systems and the ways they can influence effective compliance.

Since the responsibility for food safety rests with you, direct verification of systems is extremely important for Basic Level requirements, and you should personally systematically monitor activities on a regular basis and record your findings.

The Importance of Water Quality

The contamination of water can cause serious illnesses to consumers. Water contamination is a major source of gastrointestinal illnesses, which can be fatal to vulnerable people.

Pathogenic microorganisms in contaminated water can potentially contaminate foods when used in ingredients, ice, or steam and when there is contact with food.

Chemicals in water can also be a public health concern. It is common in some parts of the world where ground water used in food production may contain arsenic and other compounds which, when consumed by humans, can be very dangerous.

Legal Requirements and Regulations

Countries or regions typically have legislative requirements for water quality. As the food safety manager, you should refer to the local regulations on using non-potable water in food product processes since they differ from place to place.

The World Health Organisation has established guidelines for drinking water guidance in the Codex Alimentarius. These may be adopted as a national standard, but such may not always be the case.

These requirements and regulations are in place to reduce the risk of water contamination and should protect public health if all businesses follow them correctly.

Codex Requirements

The Codex provides the following requirements for the use of water in your facility:

- Facilities
- Water in contact with food
- Water as an ingredient
- Water used to make ice and steam

Facilities

The Codex requirements state that an adequate supply of potable water with appropriate facilities for its storage, distribution, and temperature control, should be available whenever necessary to ensure the safety and suitability of food.

To find correct guidance for drinking water, you should study the World Health Organisation's [Guidelines for Drinking Water Quality](#).

Non-potable water is regularly used in facilities for fire control, steam production, refrigeration, and other similar purposes where the quality of the water does not matter. Non-potable water must be identified in your facility and must have a separate system from potable systems.

Water in Contact with Food

Only potable water should be used if the water is going to be in contact with the food product. There are, however, a few exceptions when this rule does not apply:

- for steam production, fire control, and other similar purposes not connected with food
- in certain food processes, chilling, and in food handling areas, provided this does not constitute a hazard to the safety and suitability of food (for example, the use of clean sea water).

Water that is re-circulated for reuse should be treated and maintained in such a condition that no risk to the safety and suitability of food can result. You must monitor the treatment processes effectively to make sure that you have them under control.

Water that has been re-circulated but has received no further treatment and water that has been recovered from processing of food by evaporation or drying, may be used again. This water cannot be used, however, if it poses a risk to the safety and suitability of food.

Water Used as an Ingredient

You must give careful consideration when using water as an ingredient to prevent problems with safety. Potable water must be used wherever necessary to avoid food contamination.

A safety problem could occur, for example, when water is used as an ingredient in ice cream. The freezing process does not kill microorganisms, so it is very easy for a person to become ill from eating contaminated ice cream.

Water Used To Make Ice and Steam

Water may also be used as an ingredient in the form of ice or steam. Certain pathogens can survive the ice- or steam-making process, thus potentially remaining a risk to health if the ice or steam from this source comes into direct contact with food.

Both ice and steam should be produced, handled, and stored to protect them from contaminants.

Many foods have direct contact with steam. The water used in the steaming process should not constitute a threat to the safety and suitability of the products.

Correct Construction of Wells and Plumbing Systems

Your facility must have adequate and safe wells and plumbing systems to prevent the risk of contamination by water. As a food safety manager, you should know the requirements for the factory for water usage and also all the systems used. With this knowledge, you can identify any maintenance problems and can thus prevent any subsequent contamination.

Facility Requirements

The source of potable water to your facility must be a recognised one, from either a municipal supply or private well. For it to be acceptable for use, the water supply system must be properly constructed, properly maintained, and routinely tested to ensure the safety of the water coming into your factory.

If your factory receives water from a well, the well should be tested at least once a year; however, you should carry out a risk assessment to see how often testing needs to be done. This risk assessment may look at areas such as possible leaking of contaminants from farmland or industrial areas.

You must have potable hot and cold water available in processing areas. There should also be sufficient volume and water pressure to allow appropriate cleaning.

On-Site Water Treatment

If your factory has a non-potable water supply which is required to be used as an ingredient or otherwise come into direct contact with food, then this must be effectively purified to potable water quality to remove any risk of contamination.

Water can be purified onsite by a number of methods:

- sand filtration
- membrane filtration
- charcoal filtration
- reverse osmosis
- ion exchange.

Cross-Connections and Backflow

Cross-Connection

Any connection or structural arrangement between a potable water system and a non-potable system, liquid or otherwise, through which backflow can occur.

Backflow

The flow of water or other liquids, mixtures, or substances into a potable water system from any source other than the intended source.

Backflow, by its very nature of potentially mixing potable and non-potable water systems, can pose a high risk to the health of consumers.

(Source: U.S. Food and Drug Administration)

Plumbing Connections to Sewer Lines

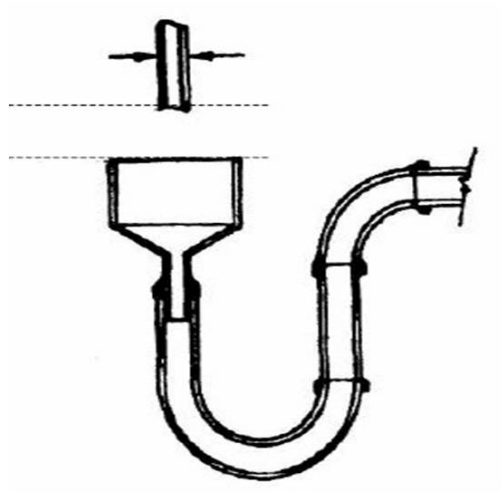
Within any water conveyance system, there are two types of plumbing connections: direct and indirect.

Direct Connection

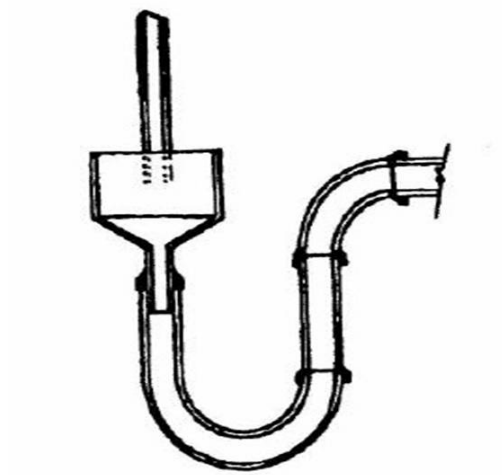
A solid physical joining to a waste or soil line

Indirect Connection

Other than a solid physical joining to a waste or soil line. It can be either an air gap or an air break.



Air gap.



Air break.

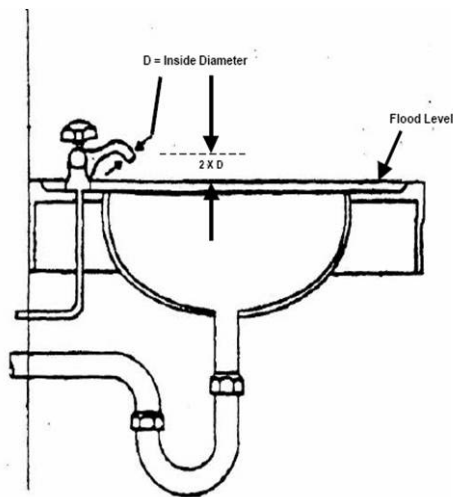
(Source: U.S. Food and Drug Administration)

Air Gap

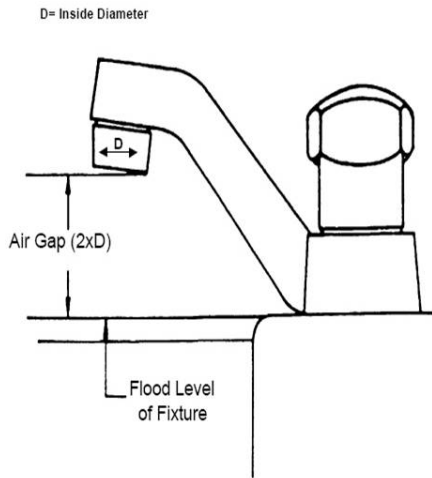
Air Gap

The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or outlet supplying fixture, or other device, and the flood level rim of the receptacle.

The vertical physical separation must be at least two times the inside diameter of the water inlet pipe above the flood rim level, but cannot be less than one inch.



Air gap on lavatory.



Air gap and effective opening.

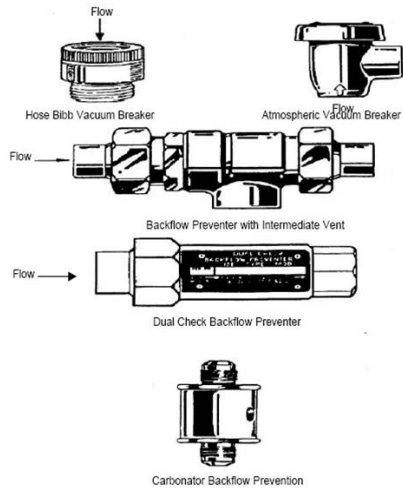
(Source: U.S. Food and Drug Administration)

Air Break

Air Break

A piping arrangement in which a drain from a fixture, appliance, or device discharges indirectly into another fixture, receptacle or interception at a point below the flood level rim.

The connection does not provide an unobstructed vertical distance through the free atmosphere and is not solidly connected, but precludes the possibility of backflow to a potable water source into a sink or dishwasher/or fixture being drained.



Backflow prevention devices.

(Source: U.S. Food and Drug Administration)

Monitoring and Management

The management of water quality in your company is extremely important. You must develop a routine monitoring system to ensure water safety for the various uses in food production. You must also be aware of any risks posed by the design of the water conveyance system; for example, the cross-connections in the plumbing system.

When your company commissions any new equipment that uses water, it must be monitored prior to full use to ensure that the safety of water is not compromised.

Food Safety: Introduction to Product Contamination Control

This module on product contamination control is part of the Food Safety Knowledge Network's Basic Level resources for food manufacturers. This module was authored by Kevin Swoffer.

Welcome

Welcome to **Introduction to Product Contamination Control**.

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Module Overview

Product contamination control is important to prevent adulteration of food products by contaminants or hazards that might injure or otherwise compromise the health of consumers. Product contamination can occur during the preparation, storage, or distribution stages.

This module covers the requirements related to effective control and management of product contamination control.

The following topics will be discussed:

- system development
- personal contamination
- cross contamination
- premises contamination

- pest contamination

Module Objectives

Upon completion of this module you should be able to

- describe the principles of and reasons for ensuring product contamination control
- explain the steps taken to minimize the risk of contamination by physical, chemical, and biological contaminants
- design a system to ensure the control of any possible product contaminants
- operate a system to ensure the control of any possible product contaminants.

System Development

As a person responsible for food safety within the factory, you must develop systems to ensure and monitor that the staff is fully aware of and uses

- good personal hygiene practices
- good practices to prevent contamination by raw materials and packaging
- good practices to prevent contamination by equipment and building fabrication
- good practices to prevent pest contamination.

Any system will have to be clearly and concisely documented and communicated effectively to appropriate staff within the company.

You must work closely with key company staff to ensure they clearly understand the importance of such systems and the ways they can influence effective compliance.

Since the responsibility for food safety rests with you, you must directly verify all systems for Basic Level requirements. You must also

systematically monitor activities on a regular basis and record your findings.

Personal Contamination

It is widely recognized that food handlers have the potential to be the most serious hazard in a food business. Bad practices of food handlers may contaminate food, resulting in food poisoning by microorganisms or foreign bodies introduced into the product.

Effective hand washing and good personal hygiene practices will significantly minimize the risk of product contamination.

It is important to introduce and maintain a system (procedures) whereby personnel carry out good personal hygiene practices:

- washing hands
- identifying illnesses
- spotting cuts, boils, and septic sores
- preventing contamination by foreign bodies
- wearing protective clothing.

Personal Hygiene

All staff must practice good personal hygiene.

Effectively washing hands and overall good personal hygiene practices will significantly minimize the risk of microbiological contamination of the product.

Hands must be washed

- upon entering a food handling or processing area
- immediately after using the toilet
- after handling raw food or any contaminated material when such could result in contamination of other food items

- after using a handkerchief
- after eating, drinking or smoking
- after handling equipment cleaning or equipment cleaning utensils
- after handling chemicals.

Since fingernails may harbor bacteria, they must be kept short and clean.

Personal Behaviors

Illness

You must be able to quickly identify any staff members who may be ill and can cause food borne illness for consumers. Your staff should be aware that they need to report any illnesses and that a decision is required by you, as the food safety manager, as to whether to allow them to begin work.

Illnesses such as colds and influenza should also be considered since coughs and sneezes can carry droplet infection for a considerable distance. Persons with bad coughs should not handle open foods.

To prevent contamination of food by harmful bacteria, blood cuts, spots, and sores must be completely covered by a waterproof dressing, preferably colored blue to aid detection if the dressing should become detached.

Foreign Bodies

Your staff must control foreign bodies:

- jewelry
- fingernails
- hair
- buttons
- pen tops
- soiled plasters
- fibers and cloth.

The risk of these potential foreign body contaminants can be easily reduced or removed by informing and training your staff of the risks and emphasizing the importance of monitoring in the workplace.

Protective Clothing

Hair nets or hats should be worn to prevent to risk of contamination by hair.

Food handlers must wear clean and washable protective clothing, preferably light-colored without external pockets. Press-studs or Velcro fastening are preferable to buttons. Your staff must be aware that protective clothing is worn to protect the food from risk of contamination, not to keep their own clothes clean.

Monitoring of Personal Hygiene Practices

All food handlers must be aware of the hygiene hazards associated with their job and controls necessary to ensure the safety of food produced. An awareness program should be implemented to ensure the competency of all food handlers to produce safe food.

Supervision and monitoring of staff hygiene practices should be carried out.

All records should be kept of all staff awareness programs, with particular emphasis on supervisory staff.

Cross Contamination

Poor quality raw materials and inappropriate packaging are one of the leading causes of product contamination.

The use of poor raw materials and inadequate safety procedures will significantly increase the probability of microbiological contamination.

Cross-contamination of products can occur through these means:

- direct – raw material and cooked material in direct contact
- dripping – incorrect storage and packaging
- indirect – inadequate personal hygiene or inadequate cleaning of surfaces the food contacts.

Your staff should be made aware of their responsibility to prevent cross-contamination in the workplace.

Raw Material Contamination

There is increased risk of the presence of food poisoning microorganisms associated with the following products

- red meat
- poultry
- untreated milk
- raw eggs
- shellfish.

All raw food and ingredients must always be kept completely separate from ready-to-eat or cooked foods (high-risk food). Your staff should be aware that good hygiene practices must be in place to prevent any contact between raw food and cooked products; for example, the liquid from thawing foods, especially frozen poultry, must not be allowed to contaminate wiping cloths, high-risk food, or equipment used for high-risk food.

Raw materials that may contain foreign bodies, which will be undesirable in the finished product, require careful inspection prior to acceptance or must undergo specific preparation as part of the production process. For example, stones must be removed from fresh peas and fragments of walnut shells cleaned from diced walnuts.

Raw Material Control Procedures

As a food safety manager, you should be aware of any potential chemical, physical, or biological hazards which may be present in specific raw materials. You need to have a pre-acceptance inspection system in place to assess the acceptability of raw material coming into your facility.

When you receive raw materials after the pre-acceptance inspection is done, a post-receipt inspection system must be in place to code the raw materials entering your premises so that they can be identified. This is a necessary step in preventing contamination issues later. Your traceability system should also include where and how the raw material is stored and where the raw material is eventually used.

When using raw materials, use color-coded wiping cloths and chopping boards. They are essential in preventing cross-contamination of products.

All staff must be trained in the prevention of contamination of raw material and made aware of the specific procedures in place to reduce contamination.

Product Packaging

Packaging should be clean and free from contaminants such as dust. The packaging must also be stored under conditions to prevent contamination.

Indeed, packaging should be controlled in a similar way as any other raw material.

Packaging should not itself pose a hazard and should be suitable for its purpose. For example, packaging should be strong enough not to break during filling, processing, or storage.

Packaging used for the storage of raw materials is very important in preventing product contamination. There should be an appropriate barrier to prevent contact between raw materials, ingredients, and finished product.

During manufacture, any unused packaging that has been removed from its protective outer packaging should be suitably protected before being

returned to storage.

Premises Contamination

The design of the premises is very important when determining risks of product contamination. You must consider the layout and design of your facilities and premises:

- secure entry points
- secure parameters
- equipment used
- glass or foreign body contamination.

The design of the premises preferably should be considered during the building of the facility, with consideration given to the availability of services: that is, electricity, gas, and water supply.

The design, layout and maintenance of the premises should be reviewed carefully on a routine schedule in order to prevent product contamination. Where necessary or appropriate, changes should be made.

Design of Facilities and Equipment

Content (as it should appear on screen):

A satisfactory design of facilities and equipment is essential in avoiding hazards of product contamination. The food preparation areas and storage areas must be large enough to hold all essential equipment, enable the effective separation of raw and high-risk foods, and permit satisfactory workflows for food, food handlers, and waste.

The following factory design principles should be followed:

- cross-contamination eliminated by separating raw and high-risk food areas and color-coding work stations

- linear workflow and progress in a uniform direction from raw material to finished product
- laundry situated in a separate room to reduce risk of contamination
- suitable and sufficient facilities for personal hygiene, cleaning and disinfecting equipment with hot and cold water essential
- equipment and utensils washing areas segregated from food production areas
- adequate refrigeration
- adequate cooking and cooling facilities
- pests denied access and harborage
- suitable staff facilities, including appropriate toilet facilities
- adequate drainage
- suitable and sufficient ventilation
- high standard of lighting
- design which prevents accumulations of dirt in inaccessible places.

Foreign Body Prevention from the Factory Fabrication

The construction of the premises is important to prevent the occurrence of foreign body contamination.

- Ceilings should be smooth, clean, fire-resistant, non-flaking, light-colored, covered at wall joints, and easy to clean.
- Walls should be clean, smooth, impervious, non-flaking, durable, light-colored, and capable of being thoroughly cleaned or disinfected. Surfaces may need to be resistant to spillages, chemicals, grease, heat, and impact.
- Floor surfaces should be clean, durable, non-absorbent, anti-slip, free from crevices, and capable of being effectively cleaned. They may need to be resistant to acids, grease, and salts; and, where necessary, should slope sufficiently for liquids to drain to trapped gullies.
- Any glass windows, if present, must be protected from breakage.
- Windows must be fitted with cleansable fly-screens.
- External doors should be screened, and all doors should be self-closing.

- Wooden finishes should not normally be used; but, if in place, these should be well-maintained and appropriately sealed to prevent product contamination.
- Suitable receptacles should be provided for the disposal of waste and debris.

Glass/Brittle Plastics Contamination

Glass and brittle plastics pose a specific health risk to consumers. It is highly unlikely that glass can be completely removed from a factory's premises, but procedures should be in place to control and manage the risk of product contamination.

As a food safety manager, you should develop a glass/brittle plastics policy that specifies requirements for shielding fluorescent tubes and light bulbs in processing areas, for protection or removal of glass gauges, emergency lights, thermometers, and wall clocks. Where glass windows are present, these must be shielded to prevent breakage.

Pest Contamination

Pests within food production factories are regarded as a serious hazard and risk to health; they not only can contaminate food with foreign bodies such as feces and hair, but they also can carry possible fatal diseases.

Control systems need to be in place to reduce the risk of pest contamination by understanding what pests are attracted to and what their habits are, along with monitoring and introducing control measures.

Reduce Attraction of Pests

It is important that pests are not attracted to the factory or allowed ingress into the factory.

Waste Control

Waste should be removed regularly from production areas and stored in covered containers. All waste must be correctly stored in covered containers that are located in one specific area.

Exterior Maintenance

There must be effective maintenance of the external perimeters of the factory to eliminate any possible harborage or attraction of pests. For example, where grass or any other vegetation is present at the perimeters of the factor, it needs to be cut and controlled so as not to encourage harborage of possible pests.

Factory Fabrication

Any open access to your factory, such as doors and windows, must be controlled. All doors must have self-closing devices, and windows must be screened.

Monitoring Pests

A monitoring and control program should be in place for keeping up-to-date records of pest control.

Regular inspections must be carried out to ensure that the factory is free from pest infestation.

The signs of infestations include

- live/dead bodies of insects, rodents, or other animals
- droppings
- holes/runs
- footprints/tail marks
- chewed paper or food
- gnawing damage
- bait takes

- scratching sounds
- grease marks on walls
- odor
- larvae/pupae
- eggs/egg cases
- webbing

In the event of evidence of pest infestation, you should take immediate action to eliminate the pests. You will also need to monitor the situation to take preventive actions to prevent any recurrence.

Food Safety: Introduction to Pest Control

This module on of pest control is part of the Food Safety Knowledge Network's Basic Level resources for food manufacturers. This module was authored by Kevin Swoffer.

Welcome

Welcome to **Introduction to Pest Control**.

This learning module is part of the Food Safety Knowledge Network Basic Level Program.

The Basic Level and Intermediate Level Programs were developed through a partnership between the Global Food Safety Initiative and Michigan State University to enhance the technical knowledge of individuals responsible for food safety, especially those working for small or less-developed businesses.

To learn more about the Food Safety Knowledge Network, please visit www.foodsafetyknowledge.network.org.

Module Overview

Pests are animals that live in or on food, such as rodents and insects. Pests in food production factories are regarded as a serious hazard and risk to health; they not only can contaminate food with foreign bodies such as faeces and hair, but they also may carry fatal diseases.

This module covers the requirements for effective control and management of pest control.

The following topics will be discussed:

- system development
- importance of pest control
- prevention
- control of pests

- monitoring

Module Objectives

Upon completion of this module you should be able to

- explain the hazards posed by specific food pests and the controls required to reduce the risk
- explain the preferred habitat of relevant invading pests in your particular facility
- explain the environmental, physical and chemical methods of preventing and controlling pest infestations in your facility
- explain the system used to monitor the effectiveness of pest controls and define corrective actions that must be taken
- design a system to minimise the risk of pest-infestation of the product and the facility by inspecting and controlling raw materials and making sure the facility is always clean and that it maintains specific control measures.
- operate a system to minimise the risk of pest infestation of the product and the facility by inspecting and controlling raw materials and making sure the facility is always clean and that it maintains specific control measures

System Development

As a person responsible for food safety within the factory, you must develop systems to ensure and monitor that the staff is fully aware of and uses

- good practices in the prevention of invading pests
- good practices to control pests

Any system will have to be clearly and concisely documented and communicated effectively to appropriate staff within the company.

It is important to work closely with key company staff to ensure they clearly understand the importance of such systems and how they can

influence effective compliance.

As the responsibility for food safety rests with you, direct verification of systems is extremely important for Basic Level requirements. You should personally systematically monitor activities on a regular basis and record your findings.

Importance of Pest Control

Pests are attracted to food premises since they are an ideal habitat in which to live and reproduce. Since pests pose a significant health risk, pest control is extremely important. Inadequate control can lead to pest infestation and serious consequences to consumer health.

Besides potential health risks, pest infestation will inevitably lead to significant waste and, therefore, commercial loss. The loss caused by pest infestation of raw materials or the finished product can be large.

This section presents information about

- the hazards posed by pests
- types of pests
- characteristics of pests.

Hazards Posed by Pests

Food products are at a high risk of contamination if control measures are not in place. Pests are carriers of food poisoning microorganisms and viruses that pose major hazards to consumer health.

In addition to the contamination by microorganisms and viruses, pests can also contaminate food with

- hair
- fur
- droppings/urine

- eggs
- dead bodies.

Certain pests, rodents in particular, can also cause significant damage to a factory by, for example, chewing through electrical wires and causing fires.

Types of Pests

There are many different types of pests that can pose a risk to human health or the commercial viability of your company. These include

- rats
- mice
- insects – cockroaches, flies, ants
- stored product pests – larder beetles, weevils, flour moths
- reptiles – lizards
- birds
- animals attracted by pests- notably, cats and dogs.

Habitats of Pests

Pests require certain conditions to survive and reproduce:

- security
- shelter
- food
- water.

As a food safety manager, you must understand what conditions allow pests to survive and reproduce. If you aren't fully aware of what these circumstances are, your business will suffer contamination and loss that may make the business no longer sustainable.

Prevention

Once pests have entered your factory, it is difficult to control and totally eliminate them, particularly if there is an infestation. You must prevent their invading your factory or facility!

Preventing any and all ingress of pests will be commercially more cost-effective than continually eliminating pest infestation.

The control of prevention of ingress of pests requires

- proofing the premises
- monitoring for signs of infestation
- practicing good hygiene.

Conditions to Minimise the Risk of Pest Ingression

Effective proofing of your factory premises is the preferred method for control of pests.

Doors and windows pose the highest risk of ingress; thus a door and window closure policy should be introduced. Other methods may need to be considered: fine mesh screens for windows and doors, self-closing mechanisms on doors, and plastic curtains on internal and external door openings.

Rodents can enter a factory through the smallest of openings, so any gap under doors should be covered with a metal plate. To prevent flying insects, reptiles, or birds, any

holes or openings in the fabrication of the factory must be filled with mortar or covered with metal/plastic sheets or mesh.

Awareness of Infestation

As the food safety manager, you must make sure all staff members are aware of signs of pest infestation and possible entry points. They should

also be aware of the importance of reporting the presence of any possible infestation right away. Signs to look for are

- live animals
- dead animals
- droppings
- damaged packaging
- smell
- smears/discolouration of walls
- larvae/pupae
- eggs
- webbing
- piles of debris
- holes in fabrication.

Good Hygiene Practices

Denying pests food and shelter in your facility is another way of preventing infestation. This can be achieved by practicing good hygiene practices, effective cleaning, and proper waste disposal.

By using good hygiene practices, your staff is removing the food and shelter pests need to survive. All staff should be aware of these good hygiene practices:

- Keep the factory clean.
- Have proper waste control.
- Be sure food in preparation areas is kept covered.
- Clean spillages quickly and effectively.
- Be sure no food is left outside the facility.
- Keep food stored off the floor and away from walls.
- Be sure raw materials are checked upon intake and during storage.
- Be sure food is stored in pest-proof containers.
- Keep drains clean and screened.
- Allow no external shelter.

Control of Pests

Prevention methods should protect you from the ingress of pests; however it is a good practice to ensure there are control measures in place to minimise the risk of pest infestation in your factory.

As a food safety manager, you have a responsibility to ensure control measures are in place.

There are two types of pest control:

- physical
- chemical.

Both types are designed to control specific types of pests, but by their very nature they should be correctly used since they themselves could pose a risk to your product or staff.

Physical Control

Physical means of control is usually the preferred option. By their very nature, however, physical means of control are not always 100% effective, a point that should be very seriously considered. In the event of a significant infestation, physical controls cannot cope with the numbers of pests, so alternative methods of elimination must be considered.

Typical physical control methods include

- electric fly killers
- rodent traps
- sticky fly strips
- curtains
- bird screens
- pheromone traps.

Since several of these methods will actually kill pests, you should consider the location and placement of control mechanisms such as electric fly killers and sticky fly traps in order to avoid possible product contamination.

Chemical Control

Chemical control measures are much more effective than physical control methods: however, chemical substances do pose possible risks to staff, so their use should be frequently and carefully controlled and monitored. Chemical substances also pose a risk to food contamination, so they should also be used only under controlled and monitored conditions.

Because of the risks involved, it is good practice to employ a professional to carry out chemical pest control.

Chemical controls include

- rodenticides
- insecticides
- fumigates.

Monitoring

Inspection of Raw Materials for Pests

An area of concern is the ingress of pests by way of raw materials. You must, as a food safety manager, be aware of your raw materials and possible pests that could live on

or infest certain raw materials. For example, some raw materials are prone to certain pests, such as flour, in which certain species of moths can live.

Systems should be in place always to inspect the raw materials, including packaging, delivered to the factory.

All consignments should be inspected for signs of pest infestation. If there is evidence of infestation, consignments should be rejected.

If specific products are known to be subject to invasion or contamination by certain kinds of pests, it is good manufacturing practice to know your supplier's pest control systems.

Professional Advice

When developing and implementing a pest control system, you may well find it advisable to seek professional advice and assistance, particularly in the event of serious problems of infestation.

Professional pest control companies can also carry out regular inspections of your facility and provide advice on best practices. If you do employ a professional pest control company, it is still your company's responsibility, however, to ensure the safety of the product. You cannot transfer your responsibility for effective pest control to some outside entity.

Regular Inspections

Regular inspections of the premises must be carried out to ensure that there is no pest infestation and that the premises are not open to the risk of pest ingress. When carrying out inspections, you will need to focus on particular areas: food storage areas, behind and underneath equipment, unlit undisturbed areas, and waste storage areas.

If there is evidence of any pest ingress or infestation, immediate corrective action should be taken to bring the situation under control. Any delay in corrective action could result in product contamination and significant commercial loss.

Food Safety: Introduction to Control of Food Hazards- General and Specific

This module on control of food hazards is part of the Food Safety Knowledge Network's Basic Level resources for food manufacturers. This module was authored by Kevin Swoffer.

Welcome

Welcome to **Introduction to Control of Food Hazards: General and Specific**.

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Module Overview

You need comprehensive knowledge to control food hazards within your company. Lack of the control of hazards can cause contamination resulting in risks to consumer health or loss of product leading to significant financial loss. Food hazards can be biological, chemical, or physical in nature. As a food safety manager, you should be aware of the significance of hazards and must identify and monitor hazards within your production process.

This module covers the requirements for effective general and specific controls to prevent food hazards.

The following topics will be discussed:

- system development
- biological hazards
- chemical hazards
- physical hazards
- control of food safety hazards.

Module Objectives

Upon completion of this module you should be able to

- describe the principles and reasons for controlling food hazards
- explain the nature of food safety hazards (biological, chemical, physical, and allergens) and factors influencing the likelihood of their occurrence (such as, conditions which influence food safety hazards commonly associated with specific ingredients used, specific processes undertaken, and specific foods produced as well as customer requirements and legislation)
- explain the recognized and known control measures and how to apply these to control hazards relevant to specific products, taking into consideration local regulatory compliance and customer requirements
- design the monitoring procedures necessary to ensure control of food safety hazards relevant to the product
- perform corrective actions when control measures are not achieved
- operate a system for maintaining comprehensive records in relation to the control of identified hazards.

System Development

As the person responsible for food safety within the factory it is important to develop a system to ensure and monitor that the staff is fully aware of and uses

- good biological hazard prevention practices
- good chemical hazard prevention practices
- good physical hazard prevention practices
- risk analysis processes to identify all possible hazards.

Any system will have to be clearly and concisely documented and communicated effectively to appropriate staff within the company.

It is important to work closely with key company staff to ensure that they clearly understand the importance of such systems and the ways they can influence effective compliance.

Since the responsibility for food safety rests with you, direct verification of systems is extremely important for Basic Level requirements. You should personally monitor activities on a regular basis and record your findings.

Food Safety

When considering food safety, you must understand the difference between quality and safety.

Food Safety (Codex Standards)

Assurance that food will not cause harm when prepared and/or eaten according to its intended use.

Food *safety* refers to attributes that cannot be directly observed, but instead require laboratory procedures for their measurement. These procedures include microbiological techniques or chemical analysis.

Food *quality* refers to attributes that can be readily observed by sight, smell, or simple measurement (such as color or condition). Food quality is easier to assess than food safety.

Definition of a Food Safety Hazard

Food Safety Hazard (Codex Standards)

A biological, chemical or physical agent in, or condition of, food with the potential to cause an adverse health effect.

Food safety hazards include bacteria, viruses, parasites, hazardous chemicals, and foreign materials that can cause an adverse health effect to a

consumer.

Food Safety Hazards

In food safety management systems, hazards refer to conditions or contaminants in foods that can cause illness or injury.

It is important to understand that hazards do not refer to undesirable conditions or contaminants such as

- presence of insects
- spoilage
- hair or dirt
- violations of regulatory food standards not directly related to safety.

Biological Hazards

There are a number of different types of biological hazards that can be present within food. These are typically microorganisms and include

- bacteria
- viruses
- parasites.

Control points for biological hazards must be identified during the process and storage of food products. This can be done by using hazard analysis techniques.

Practical Food Microbiology

Microorganisms are small, living uni-cellular or multi-cellular organisms. They include bacteria, viruses, yeasts, molds, and parasites. These are not all necessarily bad for humans; in fact, many can be beneficial to humans.

There are different types of microorganisms:

- helpful
- spoilage
- disease causing – pathogenic.

Helpful Microorganisms

Helpful microorganisms can be added to foods or are found naturally in them.

In many cases, microorganisms are used in foods to help with preservation but can also be added to create unique flavors and textures.

Foods such sauerkraut and pickles utilize fermentation as a preservation process and use microorganisms to carry out this fermentation process. Other foods such as bread use fermentation as an essential part of their production.

Spoilage Microorganisms

Spoilage microorganisms affect the quality of the product, not necessarily the safety of the food. It is usually very easy to indentify when a food product is affected by spoilage, by look or taste. There can be discoloration on fruit, molds on bread, or milk that tastes sour.

In some cases spoilage microorganisms can affect the safety of products. An example is that some fruits can decay by a mold called *penicillium expansum*. This mold produces a toxin that can affect humans.

Any foods that are found to be spoilt should be disposed of immediately, and products in the same lot should be inspected.

Disease Causing - Pathogenic Microorganisms

Disease-causing, pathogenic microorganisms can cause illnesses that can range from mild to life-threatening. These microorganisms are the most serious, so you must develop procedures to eliminate the risk of their contaminating products.

Examples of these microorganisms that should be effectively controlled are bacteria such as *Salmonella* or *E. coli* O157:H7. The common symptoms of these are nausea, vomiting and diarrhea, and, in serious cases, death.

Pathogens

Pathogens are microorganisms that cause food-borne illness. Pathogens come in three forms:

- bacteria – single-celled organisms that live independently
- viruses – small particles that live and replicate in a host
- parasites – intestinal worms or protozoa that live in a host animal or human.

Pathogens can be found in soils; these include:

- *Salmonella* species
- *E. coli* O157:H7
- *Shigella* species
- *Campylobacter jejuni*
- viruses and parasites

The presence of pathogens within humans is the main reason why washing your hands after using the toilet is essential when working with food.

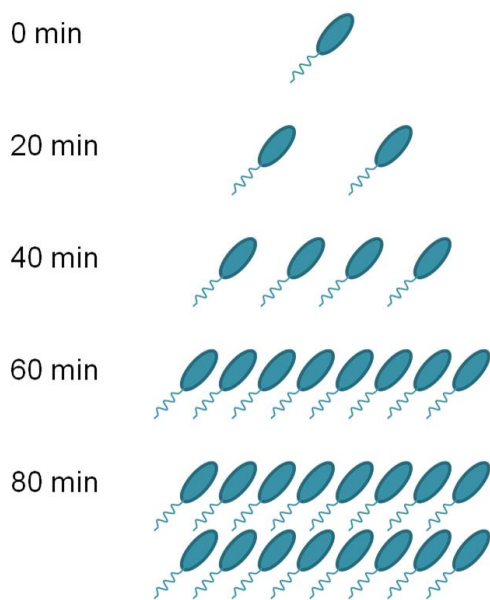
Bacteria

Bacteria are very resilient microorganisms that are found everywhere. Some examples of where they can live and multiply are

- in air, soil, and water
- in intestines of animals and humans
- on skins of fruit and vegetables
- on raw meat, poultry, and seafood
- on shells of nuts
- on insects and rodents
- on hands, skin, hair, and clothing of people.

Because of the nature and diversity of bacteria, they can be found almost anywhere in your factory. It is, therefore, imperative that bacteria and other microorganisms are controlled to acceptable levels and, in some cases, completely eliminated in the food.

The problem with bacteria when concerned with food safety is that they are single-celled organisms that can live independently. When the conditions are correct, they can divide and multiply very quickly, as is seen in the example below. To multiply, bacteria need moisture, nutrients, warmth, and time. Moisture and nutrients are found on most foods, so bacterial growth on foods is very common.



10 hours growth => 1 Billion cells!

Bacteria cause the greatest number of deaths from food-borne illnesses. They are impossible to see with the naked eye. Taking these factors into account, it is clear that controlling bacteria can be difficult but is essential.

Viruses

Viruses are different from bacteria since they do not multiply in food. They are intracellular organisms which invade living cells and then use the cell's content to replicate.

Since viruses do not multiply on food, they contaminate by human or animal interaction. Food-borne viral disease generally results from poor personal hygiene or lack of pest control.

Viruses can also survive and travel in water and ice, so it is essential that your water supply is adequate, safe, and regularly monitored.

Controlling Viruses

Personal hygiene for food handlers is extremely important in controlling viruses. All staff must be made aware of inappropriate personal hygiene practices, and monitoring should take place to ensure good personal hygiene is being followed.

Staff members who show symptoms of viral infection should be identified and kept away from food processing areas. If a food handler has a viral infection, then it is very easy to spread that virus. It is good practice to have a return to work policy in place for staff who have been absent as a result of a viral infection, allowing you thus to identify any viral symptoms that may still be present.

Viruses can be transmitted in water; potable water must, therefore, be used for ice- making or as an ingredient in food.

Parasites

Parasites can be uni-cellular or multi-cellular microorganisms. They can colonize in the gastrointestinal tract of humans and other animals.

More often than not these parasites have really complex life cycles where they may be in a human's intestinal tract for a long period of time and shed cysts. These cysts are a protected form of themselves and can infect other people or animals when they are consumed.

The most common food-borne parasites are protozoan parasites and parasitic worms.

Protozoan Parasites

Protozoan parasites, which are uni-cellular organisms, are the most common food-borne (or water-borne) parasites. They are so common in some parts of the world that they are endemic. Examples of protozoan parasites include

- *Giardia lamblia*
- *Cryptosporidium parvum*
- *Cyclospora cayetanesis*
- *Toxoplasma gondii*

Parasitic Worms

Parasitic worms are small, multi-cellular organisms which can colonize in the gastrointestinal tract or other tissues of humans or animals.

Some common parasitic worms include

- *Anisakis simplex* and related worms
- other seafood-associated parasitic worms
- *Trichinella spiralis* and related *Trichinella* species
- *Ascaris lumbricoides* and *Trichuris trichiura*.

Controlling Parasites

Since parasites can be found in feces, there is a risk of contamination when using manure for fruit and vegetable crops. Consider using compost that does not contain manure to remove the risk of this parasitic contamination.

Since parasites can live in water, you must use potable water for the washing, packing, and processing food products.

Thermal processing can destroy parasites; so if appropriate, use this treatment to remove the parasite risk.

General Control Points for Biological Hazards

Product Specification

It is important to be aware of the presence and number of microorganisms in food. Many raw materials, therefore, have microbiological standards. It is common in the food industry to have specifications for the absence of microbiological contaminants.

Control Mechanisms

Physical and chemical control mechanisms significantly affect the survival and multiplication of microorganisms; for example, a reduction in pH in fruit juice by the addition of ascorbic acid can prevent microorganisms from multiplying.

Time and temperature are important control points since cooking or freezing rapidly can prevent the growth of biological contaminants. Freezing usually stops the multiplication of microorganisms; however it does not kill them. Thermal processing will kill most biological hazards.

Cross-Contamination

Cross-contamination must be managed so that materials cannot contaminate others. Control systems should be in place and your staff made aware of

their responsibility to prevent contamination. Your staff must also be aware of correct product handling and personal hygiene.

Cleaning and Disinfection

The equipment used for producing, processing, and storing products should be sanitized on a regular basis. It is good practice to have a cleaning schedule in place.

The packing, storage, and distribution must be controlled so that no biological hazard can contaminate or survive on food products. This process will entail suitable packaging for the product and temperature control in storage and distribution.

Conditions for Use

The directions you provide to the consumer are very important. Providing information on how to correctly store and cook the product can reduce the risks of biological hazards.

Chemical Hazards

There are different types of chemical hazards associated with food:

- naturally-occurring chemicals
- intentionally-added chemicals
- unintentional or incidental chemical additives.

Control points for chemical hazards must be identified during the process and storage of food products. Such can be done by using hazard analysis technique.

Naturally Occurring Chemical Hazards

There is a perception that if something is naturally grown or raised it will not have any chemical hazards present. This belief is not true; naturally

occurring chemical hazards are present in many foods. For example, there are toxins found in many varieties of mushrooms and some seafood.

In many countries there is legislation relating to the presence or level of toxins, so you should be aware If you are using foods which may contain these toxins. It would be good practice to refer to legislation and analysis samples of the product before use.

These chemical hazards are often classified as biological, but the important thing is that it be recognized as a hazard and controlled.

Examples of naturally occurring chemical hazards are

- toxins produced by *Clostridium botulinum*, *Staphylococcus aureus*, *Bacillus cereus*
- Scombrototoxin (histamine) – fish
- Saxitoxin – paralytic shellfish toxin
- Ciguatera toxin – finfish
- Mycotoxins – produced by moulds (fungi).

Intentionally Added Chemicals – Food Additives

There are two types of intentionally added chemicals, direct and indirect food additives.

Direct additives are compounds such as preservatives; these include nitrites, sodium benzoate, and sulfiting agents. You must be aware of the regulations relating to the use of these compounds since legislation does differ from country to country.

Additives such as colors and nutritional additives (such as vitamins) are also direct. All direct additives must be included on all labels. You can see from the table the risks of using direct food additives improperly.

Indirect food additives include

- adhesives

- paper and paperboard components
- polymers
- adjuvants, protection aids, and sanitizers.

In most cases these indirect food additives are undesirable and migrate into the food from inappropriate packaging.

Unintentionally Added Chemicals

There are a number of unintentionally introduced chemicals added to foods by agricultural processes, including

- pesticides
- fungicides
- herbicides
- fertilizers
- antibiotics
- growth hormones.

These substances are prohibited in certain countries. To ensure your company is complying with legislation where the food is sold, you should carefully review the appropriate legislation.

There are private standards and business-to-business requirements that can be stricter than legislative requirements, and the customer will closely scrutinize the product for the presence and level of substances that violate these standards.

Source	Why a Hazard?
Agricultural Chemicals (e.g. pesticides, herbicides)	If improperly applied, some can be acutely toxic or may cause long-term health effects
Cleaning Chemicals (e.g. acids, caustics)	Can cause chemical burns if present in the food at high levels
Equipment Components (e.g. copper pipe fittings)	Acidic foods can cause leaching of heavy metals from pipes and joints (e.g. copper and lead)
Maintenance Chemicals (e.g. lubricants)	Some chemicals that are not approved for food use may be toxic
Packaging Materials (e.g. tin)	High nitrite levels in food can cause excessive detinning of uncoated cans resulting in excessive levels of tin in the food

Controls of Chemical Hazards

Having a management system in place that identifies sampling points and sampling levels is good practice to reduce the risk of chemical hazards. The table shows suggested areas of inspection.

Physical Hazards

A physical hazard is any potential harmful extraneous matter not normally found in food. They are different to biological or chemical hazards: they generally cause problems for relatively few consumers per incident. The result of personal injuries is usually not life-threatening but can cause considerable personal distress to the consumer. Typical examples are broken teeth, cut mouths, and choking.

Examples of physical hazards

- metal fragments
- glass particles
- wood splinters
- rock fragments

- stones
- bone fragments (meat and poultry)

Control points for physical hazards must be identified during the process and storage of food products. Such can be done by using a hazard analysis technique.

Preventing Physical Hazards

Preventive maintenance of equipment is extremely important to greatly reduce the risk of physical contamination.

Equipment failure or breakage can allow physical hazards to enter foods. This happens usually during the processing stage. Routine inspections and maintenance of the equipment is good practice.

Screens and filters used in liquid processing can identify problems in equipment upstream. By regularly inspecting the screens or filters, objects from equipment (broken machine parts or rubber seals, for example) can easily be seen and further contamination reduced.

Control or Detection Equipment

Detection equipment is very useful in identifying physical hazards in foods. There are a number of methods that can be used for different processes:

- magnet – ferrous metals
- metal detector – ferrous and non-ferrous metals
- X-ray equipment – all types of physical hazards
- screen or sifter – separation by size
- aspirator – segregation by weight
- “Riffle Board” – removal of stones from beans
- bone separator – mechanically-separated meat.

Employee Practices and Physical Hazards

The staff can pose a risk to foods by physical hazard contamination. In order to prevent/reduce this risk, your staff must be made aware of company policies in regard to hazard prevention. An example is the wearing of jewelry.

Your staff should also be encouraged to make you aware of any risk of possible physical product contamination they observe while at work.

Sources and Controls of Physical Hazards

As a food safety manager, you must have in place an effective management system that identifies the source and control points to reduce the risk of physical hazards. The table shows physical hazard control methods.

Control of Food Safety Hazards

To control food safety hazards effectively, it is important to understand the nature of possible hazards. Not all substances or microorganisms are hazardous until they reach a certain level, so it is important to know and understand the significance of these levels.

Possible hazards are always going to pose a risk to your company, so it is essential to know how to control these hazards. By using different methods such as destroying, removing, preventing, or reducing hazards to an acceptable level, contamination issues will be greatly reduced.

To control food hazards, you must have a system in place that maintains control points within the process. You must have knowledge of how to develop this system so that any change can be taken into account and managed correctly.

Food Safety: Introduction to Control of Food Hazards- Allergens
This module on control of food hazards is part of the Food Safety Knowledge Network's Basic Level resources for food manufacturers. This module was authored by Kevin Swoffer.

Welcome

Welcome to **Introduction to Control of Food Hazards: Allergens**.

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To learn more about the Food Safety Knowledge Network, please visit www.foodsafetyknowledgegenetwork.org.

Module Overview

It is important to prevent adulteration of food products with contaminants or hazards that might injure or otherwise compromise the health of consumers. Food allergens can be a significant health risk to those consumers who have allergic reactions to specific foodstuffs. Allergens can contaminate food products during the preparation, storage, or distribution stages. If there is a risk that food products have been contaminated by a known allergen, the food must be immediately removed from the food supply chain.

This module covers the requirements related to effective control and management of allergens.

The following topics will be discussed:

- system development

- the importance of allergens
- the handling and control of allergens.

Module Objectives

Upon completion of this module you should be able to

- describe the principles and reasons for controlling food allergens
- explain regulations and customer requirements governing the presence and control of allergens
- explain the recognized and known control measures and how to apply these to control food allergens within the facility, taking into consideration local regulatory compliance and customer requirements
- design monitoring procedures necessary to ensure control of food allergens
- perform corrective actions when control measures are not achieved
- develop a system for maintaining comprehensive records in relation to the control of allergens.

System Development

As the person responsible for food safety within the factory it is important to develop a system to ensure and monitor that the staff is fully aware of and uses

- good personal hygiene
- practices to prevent contamination by raw materials and packaging
- good practices in cleaning and housekeeping

Any system will have to be clearly and concisely documented and communicated effectively to appropriate staff within the company.

It is important to work closely with key company staff to ensure they clearly understand the importance of such systems and the ways they can influence effective compliance.

Since the responsibility for food safety rests with you, direct verification of systems is extremely important for Basic Level requirements: you should personally monitor activities on a regular basis and record your findings.

The Importance of Allergens

It is important to understand what a food allergy is and how it affects the human immune system. It is also important to understand the difference between food allergies and food intolerance.

A food allergy is a reproducible adverse reaction to a particular food that involves the immune system. Nearly all allergens are proteins.

Food Allergen

a form of food intolerance associated with a hypersensitive immune response mediated reaction *in which antibodies are formed*.

Food Intolerance

a reproducible reaction to a food which occurs *without a hypersensitive immune response*.

The effect of food allergens differs by population, as can be seen in Europe. There, an allergic reaction to the onion in the Western Europe is virtually non-existent. However in Eastern Europe there are an increasing number of cases where allergic reactions to onions occur.

On a global basis, approximately 1-2% of adults and 5-8% of children suffer from a food allergy. These figures are increasing each year.

The Effects of Food Allergies

In some cases, a reaction to a food allergen can result in death within a short period of time. A perfectly healthy individual can have a serious reaction that results in death within an hour of consumption.

Another important fact is that in some individuals as little as 1 mg. of an allergen can cause a serious reaction that can result in death.

Many people die each year from food allergies; for example, 100 deaths in the United States in 2006 resulted from peanut allergies.

Symptoms of an Allergic Reaction

There are different symptoms for allergic reactions to food. Some people suffer only very mild reactions while some can suffer very serious health effects, even death.

Typical symptoms of an allergic reaction to food are as follows:

- respiratory reaction, such as asthma
- gastrointestinal reaction , such as vomiting or diarrhea
- skin reaction, such as dermatitis
- anaphylactic shock – evidenced by a drop in blood pressure, severe constriction of airways, multiple organ failures, and/or death.

Legal Requirements for Food Allergens

Because of the severity of food allergens, legal requirements have been put into place to ensure the correct labeling of foods. Food labeling should inform the consumer of the presence of known food allergens as an ingredient in the food or any possible cross-contamination of a known food allergen which may have taken place during its preparation.

Legislation put into place within the EU, US, and Australasia requires specific ingredients to be clearly listed on certain foods to highlight the presence of allergens.

The legislation listed below is the EU, US, and Australia/New Zealand's requirements for food allergens:

- EU – Directive 2003/89/EC as regards to indication of the ingredients present in foodstuffs.
- US – Public Law Section 201-210
- Australia/New Zealand – Food Code Standard 1.2.3

As a food safety manager, you should be aware of the markets where the products you produce will be sold and thus ensure that your product is labeled in accordance with the above legislation.

You must appreciate that there are differing allergens specified within these legislative requirements and that these requirements may be amended and updated in line with the increasing diversity of allergen reaction to specific foodstuffs.

The Handling and Control of Allergens

Because of the importance of food allergens to consumer health, a system for managing the control of allergens should be in place. This system must have control measures for cleaning, packaging, and raw materials/ingredients as well as sessions for employee training and instruction.

As previously mentioned, very small quantities of certain food allergens can cause serious health effects or death, so good management of all these areas within the food business is essential.



People Control Measures of Food Allergens

The knowledge and behavior of the staff is extremely important in the control of allergens.

Staff Awareness

All staff must be made aware of the importance of allergen control. The training should include product identification and recipe control. Where rework, is used staff should be aware of specific control measures to prevent cross-contamination.

Protective clothing soiled with a food allergen can pose a risk of contamination. Staff should be made aware that soiled clothing must be changed when working with specific food products.

Personal Hygiene

Hand washing is important in allergen control since contamination can occur when working with different ingredients. Staff members must wash

their hands between the uses of different ingredients.

Waste Control

The staff should be aware of the correct procedures for waste disposal, particularly when the product contains allergens.

Equipment

When using utensils for the production of food products, the staff must be trained in reducing contamination by cleaning the utensils when using them for different foods. The production of chocolate provides a good example . Some factories make chocolate containing nuts and also without nuts. If they use the same utensils or equipment, they risk contaminating the product. The staff should clean all utensils and equipment to remove the risk of allergen contamination. It is good practice to use separate utensils for specific food products.

Food Consumption

Consumption of certain products by staff members can introduce allergens into the foodstuffs being produced. Good management practice dictates that eating and drinking shall be restricted to the canteen or external areas away from food products or ingredients. Good management practice also dictates a hand washing policy: all staff must wash their hands before entering a food production area.

Raw Materials and Ingredients Control Measures of Food Allergens

It is crucial to know the status of the raw materials and ingredients that you receive from your suppliers. If the ingredients you obtain from your suppliers are contaminated with allergens, then all your precautions you take in your factory to control allergens will be pointless. Ask questions of your suppliers. For example, ask them about their cleaning schedules and the ways they store their products.

If you have an allergen as an ingredient or an ingredient contains an allergen, then these products must be clearly identified and controlled within your factory. The preferred means of identification is clear labeling of the product. Staff members can, therefore, easily identify and control the use of these products throughout the process.

It is essential to keep comprehensive records of all recipe batches and production schedules to verify the effective control of allergens.

Packaging Control Measures of Food Allergens

The control of the use and storage of packaging is important to reduce possible cross-contamination by allergens.

Incorrect storage of packaging can introduce allergens into the product. Packaging that is meant to contain “allergen free” products should be securely stored away from other packaging.

The most common problem in allergen control is the placing of product into incorrect packaging. Special emphasis should be placed on process control when there is a change in a product’s recipe on the production line. Measures must be put in place to ensure that the product is placed in correct packaging.

Controls at the packaging stage of the product are extremely important.

Cleaning Control Measures of Food Allergens

Allergens can contaminate products when cleaning is not done competently. Cleaning within the factory should be carried out on a comprehensive cleaning schedule with subsequent monitoring for effectiveness.

Allergen-dedicated cleaning equipment should be used to clean all areas that pose a contamination risk.

As a food safety manager, you are responsible for developing an effective cleaning schedule that minimizes the risk of all possible allergen contaminants on equipment and the factory environment. Your emphasis should be placed on equipment that requires dismantling for effective cleaning to ensure all allergen contaminants are removed before reuse.

Your staff should be aware that any spillages must be cleaned immediately.

Production Measures of Food Allergens

Production processes and schedules have a significant influence on the control of food allergens.

Where possible, foodstuffs that contain allergens should be processed on specific equipment or in specific areas of the factory to reduce the risk of possible cross- contamination. But other measure should also be used to control food allergens. For example, installing physical barriers such as doors between processing rooms reduces the risk of cross- contamination.

Dedicated utensils that are used just for specific foodstuffs will help reduce allergen contamination; for example, utensils that are color-coded for use on products that contain nuts should not be used for any other foodstuff.

The movement of materials and equipment within your factory will also help reduce the risk of allergens contaminating products.

Production scheduling is a key in the control of food allergens. Scheduling sufficient time for effective cleaning, for example, will reduce the risk of allergen contamination.

Reworking a product back into the production line is a high-risk process because the identity and status of the product can be lost if the control measure are not in place. The loss of identity means allergens can easily be put into a product that is not labeled to indicate the presence of an allergen.

Corrective Actions

Because of the severity of the food allergen, it is essential to take corrective action as soon as you are aware of any contamination or incorrectly labeled product.

The product should be quarantined in the factory and a decision made on the use or disposal of the product. However, if the product is already in the distribution system and could be consumed by the buyers, actions to effect product recall must be initiated.

Food Safety: Introduction to Incident Management

This module on incident management is part of the Food Safety Knowledge Network's Basic Level resources for food manufacturers. This module was authored by Kevin Swoffer.

Welcome

Welcome to **Introduction to Incident Management**.

This learning module is part of the Food Safety Knowledge Network Basic Level Program.

The Basic Level and Intermediate Level Programs were developed through a partnership between the Global Food Safety Initiative and Michigan State University to enhance the technical knowledge of individuals responsible for food safety, especially those working for small or less-developed businesses.

To learn more about the Food Safety Knowledge Network, please visit www.foodsafetyknowledge.network.org.

Module Overview

Your company's main objective is to produce safe and legal food. As the person responsible for food safety, it is important that you ensure that the product produced and placed on the market is safe and poses no risk to customers' health. You must know how to minimize risk and safeguard customers.

It is the legal **responsibility of the manufacturer to produce safe food**. In many countries there is a legal obligation to have procedures in place to ensure that if a company suspects or is aware that it has placed unsafe food on the market, the company must quickly and effectively withdraw the product from the market and inform the customers. You also must ensure that the product is of the quality demanded by and agreed upon with the customer.

In the event that the quality of the product supplied to a customer could lead to complaints or commercial loss, then these situations must quickly and effectively be managed to make sure your company's reputation is not compromised and customers are not made ill. A poorly controlled incident management system will have a direct effect on the reputation and commercial well-being of your company.

This Basic Level learning module covers the requirements for effective implementation and maintenance of an incident management system.

The following topics will be discussed:

- system development
- evaluation of incidents
- complaint handling
- product quarantine
- product recall.

Module Objectives

Upon completion of this module, you should be able to

- understand the principles and reasons for an effective incident management system
- provide specific knowledge for all product safety issues/complaints
- provide specific knowledge about the significance of product safety issues/ complaints
- provide specific knowledge about the design and maintenance of a quarantine procedure for all products affected within your company
- provide specific knowledge about the design and maintenance of the product recall system.

System Development

As the person responsible for food safety within the factory, you must develop procedures to effectively quarantine an unsafe product ensure the training of the employees in the product quarantine system

- monitor staff on the practices involved with the product quarantine system
- recall a product quickly and effectively
- ensure the training of the employees in the product recall system
- monitor employees as they take the steps to recall a product
- develop guidelines to discipline and/or retrain employees in product quarantine practices and product recall procedures.

Any system will have to be clearly and concisely documented and communicated effectively to appropriate employees within the company.

It is important to work closely with key company employees and managers so that they clearly understand the importance of such systems and their roles in achieving effective compliance.

Since the responsibility for food safety rests with you, direct verification of all matters is extremely important for Basic Level requirements. You should personally and frequently monitor activities and record your findings.

Evaluation of Incidents

Incident

Any event where, based on the information available, there are concerns about actual or suspected threats to the safety or quality of a product that could require intervention to protect consumers' interests.

As a person responsible for food safety management, it is imperative that you have a system in place to

- identify when an incident is or has occurred
- assess and analyse the significance of the incident and the potential risk to the consumer
- decide upon the appropriate action to take to protect consumer safety and your customer's reputation.

In any working day, information about potential problems with food products is continually entering and transferred around a company; for example, raw materials are outside agreed specification; the wrong

ingredients are placed in a batch of products; or a piece of equipment has broken down or malfunctions. There must be good and quick internal communication to make sure that information about product problems, and more importantly incidents, are collected and quickly assessed by you and your colleagues to understand their significance and impact.

Identification

You will have to analyze and make judgments about what to do when *issues* or *incidents* occur. You will have to decide what action to take, if any.

The process of identifying incidents is based on your knowledge of the likelihood of something occurring and its possible severity or effect. It is very much linked into the understanding of hazards in the workplace and knowing your raw materials, the manufacturing process, product, suppliers, and people working with the product.

The keys to quickly indentifying an incident are knowledge, communication, training, and vigilance.

Since you will be responsible for deciding upon and coordinating actions when a problem occurs, communication between you and your colleagues is essential to keep all informed about what is going on or has been revealed. Their cooperation is vital in maintaining control a situation.

Handling complaints and analyzing them correctly are key factors in the relationship between you and your customers. There should be accurate and timely transfer of information.

Analysis

To ensure a correct judgment is made on the action to be taken to safeguard consumer safety, you must carefully screen the information you have. Accurate information and data is necessary, but on some occasions

information may not always be readily available. Then your knowledge and experience as the food safety specialist within your company becomes vital.

When you become aware of an issue or incident, you must gather as much information as possible in order to understand fully the hazard, the nature of the complaint/issue, and its significance.

There are three steps to the analysis of incidents:

1. identifying the hazard's effects: the nature of the possible effects on consumer safety
2. assessing the risk to the consumer: as accurate an assessment as possible of the exposure to the consumer and the safety risk involved
3. assessing the actions required: determining the options available to ensure consumer safety and making the decisions about what actions are appropriate and must be taken.

Decisions should be made using knowledge and advice from a number of reliable sources such as the expertise of employees with the company, reference to literature, government officials, research associations, consultants, and/ or customers. The decision-making process, however, should be carried out in a timely manner since delay could lead to increased risk of exposure to customers, which should be avoided at all costs.

If your company supplies large retailers and manufacturers, these companies may have highly qualified staff that can also assist you in making necessary decisions.

Required Action

There are four courses of action which can be taken following careful decision-making:

1. review, revise, and continue to monitor the current situation
2. quarantine the product within your control but do not inform customers

3. provide information to customers
4. initiate a product recall.

You may determine after careful consideration that the information and data reviewed indicates that no significant corrective action is required at that time. But you will need to continue to monitor the situation carefully and frequently.

If a product is unsafe and you have decided that the situation dictates that the product must not be dispatched to any customer, the product shall be immediately quarantined and under no circumstances released from your control.

If you believe there is significant risk to the consumer or reputation of your customer and the product has already been dispatched and is not now directly controlled by your company, you must take urgent steps to inform your customers. Customers will have differing requirements in place and will react differently. You need to provide as much accurate information to them as possible to allow them to act quickly to quarantine the product in their supply chain.

In the event that there is evidence that the product poses a risk to the health of consumers and there is a likelihood that consumers have bought or could consume the product, you must recall the product.

Product Recall

The process by which a product is removed from the market, where the product has reached consumers and they are advised to return or destroy products supplied to them.

Complaint Handling

The importance of an effective complaint-handling system cannot be emphasized enough. Complaint feedback provides invaluable information to you as the person responsible for food safety on your performance and the effectiveness of food safety and quality systems.

If there is an incident, an effective complaint handling system will provide you and your colleagues with vital information, allowing you to accurately assess the risk and thus take appropriate action. Being proactive in handling complaints means that you must identify the severity and the significance of the complaints.

All companies within the supply chain should have effective procedures for handling complaints and understand how information gathered relates to product safety and their customers. These procedures should be fully documented with specific personnel trained to handle them. There should be an individual available at any time within each organisation who is responsible for dealing with serious complaints.

Consumers tend to complain directly to the brand owner or to the organisation who sold the product to them. Thus there is a shared responsibility for the assessment of complaints in determining their source and importance. Since you are the person responsible for dealing with complaints, you must fully understand your customers' needs.

Required Action

All complaints are important. There should be a procedure in place which specifies

- who is responsible for dealing with complaints
- how a complaint is investigated
- how a complaint investigation is reported and, where appropriate, information about the investigation is provided to the complainant
- how much time is required to investigate and to document (or report) on the outcome of the investigation
- how complaints are reviewed.

The regular review of complaints is a useful practice to help you understand the performance of your food safety management system and to identify any potential hazards which you may be unaware of.

Product Quarantine

A product may be quarantined for a number of reasons:

- You have identified that the product is unsafe.
- You have identified that the product is potentially unsafe and is being held pending further investigation or checking before a decision can be made.
- A product has been returned from a customer and thus should not be used.

Quarantine means that the product is held under secure conditions to ensure that it is not used or dispatched. Under no circumstances can it be used until authorization for its movement or use is given by an appropriate person.

If you are the person responsible for food safety, it is important that you be fully aware of the quantity, condition, and status of all quarantined products under your control.

Required Action

Once a product has been placed in quarantine, under no circumstances should it be used, or dispatched, without authority by an appropriate person.

Factories are busy places. Preferably quarantined products should be physically isolated to a clearly-designated area where access is restricted to employees authorized to enter this area.

In many factories, however, this is not normally the case; so the product must be clearly marked or identified as being quarantined and employees must be trained to recognize the product status and the significance if the product is used or dispatched. It is advisable that all quarantined products be physically marked with very recognizable colored labels, marks, or symbols which are not easily removed. (Products should be marked even if placed in designated quarantine areas).

You should be fully aware of any possibility that the quarantined product could be accidentally used or dispatched by employees or staff and introduce procedures to minimize the risk of such happening. This process should involve key staff/employees who are handling, storing, or dispatching the product.

Product Recall

Product Recall

The process by which a product is removed from the market, where the product has reached consumers and they are advised to return or destroy products supplied to them.”

The Codex Code of Practice - [Recommended International Code of Practice General Principles of Food Hygiene Cac/Rcp 1-1969, Rev. 4-2003](#) states,

"Managers should ensure effective procedures are in place to deal with any food safety hazard and to enable the complete, rapid recall of any implicated lot of the finished food from the market." "Where a product has been withdrawn because of an immediate health hazard, other products which are produced under similar conditions, and which may present a similar hazard to public health, should be evaluated for safety and may need to be withdrawn. The need for public warnings should be considered."

As the person responsible for food safety, the development and maintenance of product recall procedures rests with you. You must gain the cooperation and commitment of your management and colleague so that when a serious problem arises you have full support to deal authoritatively and effectively with the situation.

In operation, the product recall process is complex and will become more complex as a company grows and the number of customers increases, but the principles that should be in place to support an effective product recall are relatively simple.

Procedures

As with the development of any procedure, you must carefully define

- who
- what
- how
- when.

Procedures must be documented. They must focus on consumer safety at all times. Key operations are

- restriction of any further unsafe products entering the supply chain
- the accuracy of information regarding the location of unsafe products
- the accuracy of information regarding your customers
- the operational method for communicating with your customers and other interested parties.

Since customer safety is paramount, you should make provision that you or a trained deputy be available at all times. It is also important that the procedures put in place must be followed at all times.

Communication

Good communication is vital to ensure that the safety of consumers is not compromised.

There are three important principles for effective communication in incident management:

1. There must be well-defined communication pathways.
2. Communication must be accurate and easily understood.
3. Communication processes must be fast and effective.

In a product recall, speed and accuracy of communication are vitally important. Customers should be contacted without delay.

Communication is a two-way process, so you need to confirm your company's contact data to your customers and suppliers. You should have

access to your emergency contact list at all times, allowing communication at any time. All contact data (your company, customers, and suppliers) must be accurate, and there must be a defined procedure in place to maintain the currency of this data.